Transforming Geospatial Engineering ...Critical to Success of the Objective Force

By Colonel David A. Kingston, Lieutenant Colonel Steven H. Tupper, and Major Carl G. Herrmann

With the fielding of the Digital Topographic Support System (DTSS) and the increase in the size of terrain detachments in the heavy divisions and the Stryker Brigade Combat Team (SBCT), many changes in geospatial engineering have occurred over the past five years. These changes enabled significant improvements in geospatial engineering support to commanders and proved critical to success in recent combat operations. (The article on page 27 tells how the DTSS supported Operation Enduring Freedom.)

As successful as we are, our current capabilities still do not meet the total requirements for our Legacy and Interim Forces. Furthermore, the requirements for geospatial engineering support for the Objective Force will be even greater. This article explains how the geospatial community will transform to meet the needs of the Objective Force. It also covers deficiencies in the current force that must be fixed, what we see as the emerging geospatial requirements for the Objective Force, and the organizational and materiel system changes that are necessary to meet these requirements.

Current Force Support Deficiencies

One deficiency in the current force is a lack of accurate, robust, and timely geospatial data for worldwide missions. The possibility exists that a terrain team will not have the required terrain data to support a unit's mission and will have to acquire that data from an outside source or create it internally. The National Imagery and Mapping Agency (NIMA), headquartered at Bethesda, Maryland, is the primary outside source for our digital geospatial data and imagery. The problem commonly associated with this source is that the resolution is often insufficient (for example, Digital Terrain Elevation Data [DTED] Level 1 or 2, with 100- and 30-meter spacing), and it often takes too long for NIMA to provide the data. When terrain teams support operations, particularly special or airborne operations or military operations on urbanized terrain, high-resolution geospatial data (such as DTED and Imagery of 1 meter) is often required. Thus, to overcome the shortfall, terrain teams need to have the capability to generate their own geospatial data internally. The current DTSS suite of software tools has limited capabilities to rapidly generate geospatial data.

Another deficiency of the current topographic force is that the organizational structure is not designed for generation, management, fusion, and dissemination of digital data. The current organizations do not support the growing geospatial needs of the Army. A case in point is the topographic unit chain of command: units designed to task have no authority to task. For example, the production and control (P&C) team has the mission to manage P&C for an entire theater, but it has no authority over the underlying geospatial units. Additionally, there is an awkward relationship between the topographic battalion and the accompanying P&C team. While both are led by a lieutenant colonel, their lines of responsibility seem to be interwoven.

Finally, there is no distinct line of communication between the terrain team assigned to a brigade and units assigned at echelon-above-corps units. There is no established organizational structure that a terrain team can use to acquire new or updated terrain data from a higher-echelon support unit.

A further deficiency of the current structure is that there are still seven divisions in the active Army that have only a single nine-person terrain team assigned to them. Digitized divisions have 36 soldiers who support them and each maneuver brigade. This capability should not be limited to the digitized divisions; the nondigitized divisions can also make use of these larger terrain teams.

Objective Force Support Deficiencies

The Objective Force has a number of constructs that will cause it to fight in a manner completely and totally different than the way we fight current forces. These constructs include—

- *Use of knowledge as a substitute for armor and mass.* The Objective Force must see first and understand first to be successful. In the case of geospatial engineering, this will require an unprecedented amount of timely, accurate, and robust geospatial data to proactively understand the effects of terrain. This is particularly true if we are to accomplish the concept of assured mobility. In this case, knowledge of the terrain is part of the first of the four imperatives of the assured mobility concept. Our current organizational structure and materiel solution don't even come close to meeting this requirement. We can't rapidly generate data, and we can't manage data sufficiently.

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- *Use of reach-back to minimize the footprint of deployed forces.* This requires robust home station operating centers (HSOCs) and high-capacity communications systems, plus the ability to fuse/conflate data from multiple sources. It also requires a capability to create a predictive geospatial tool that can be disseminated to soldiers for use in a stand-alone mode. None of these currently exist.
- *Emphasis on battle command.* Objective Force systems must have as their main focus the ability to support the commander wherever he may be to execute the art and science of command. Individual stovepipe systems will not work for the Objective Force. The current Army Battle Command System, which includes DTSS, does not meet this requirement. There must be organizational and system changes.

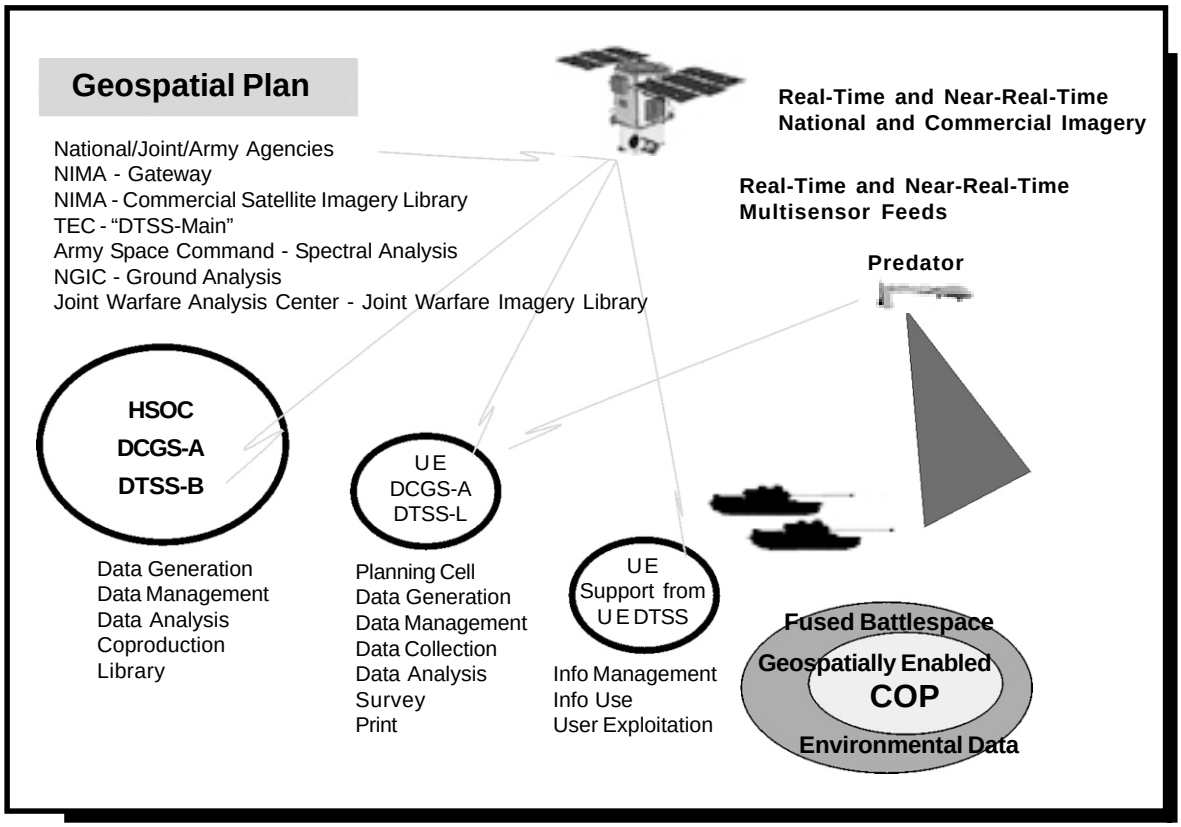
Objective Force Organization and Materiel Solutions

From the above, it is obvious that organizational and materiel changes are needed if the geospatial engineering community is to meet the requirements of both the current and Objective Forces. It is clear that the organization needed to support the Objective Force must have some capability at the unit-of-action (UA) level, a fairly robust topographic capability at the unit-of-employment (UE) level, and a very robust capability at the HSOC level. The organization must enable the critical missions of data generation, management, analysis, survey, and printing. The figure below shows the operational architecture that we believe is needed to make this work.

Table 1, page 32, shows the major teams that we envision will be put together as modules that will be able to execute at the UE and be plugged into the UA, should it need augmentation. Also shown is a geospatial planning cell at theater level that will have all of the capability needed for the entire theater (such as database management, conflation, and generation).

As far as the HSOC is concerned, we envision the Army's Topographic Engineering Center (TEC) at Alexandria, Virginia, as being the premier geospatial engineering center of excellence. However, TEC's current organization would need to be greatly expanded in size and capability to meet the Objective Force HSOC requirements.

The Objective Force will also require major upgrades to our primary system—the DTSS. This system, which we currently call DTSS-Objective Force (DTSS-OF), must be able to rapidly generate data from numerous sensors and sources, to include sensors in unmanned aerial vehicles (UAVs) and satellites and data sources from NIMA; the National Ground Intelligence Center (NGIC), Charlottesville, Virginia; TEC; etc. The Objective Force system must rapidly generate whatever data it needs to support specific missions. All this must be semiautomated in gathering data from whatever source is available, generating the data, and providing the smart geospatial database (logic



Geospatial Structure Based on Small-Unit Modules	
Geospatial planning cell	HSOC (joint-land component commander level) Theater
Geodetic survey	(UE level) Corps
Geospatial data collection/ cartography/printing	(UE level) Corps
Data generation	(UE level) Division
Data management	(UA and UE levels) Brigade
Geospatial analysis	(UA and UE levels) Brigade

Table 1

DTSS-OF Major Requirements/Capabilities
■ Precision push of terrain information/intelligence to user
■ Exploitation down to user/command and control system (command/joint mapping tool kit [C/JMTK]) by applets (terrain reasoning)
■ Advanced inputs and outputs
■ Intuitive visualizations
■ Position navigation (POS/NAV) enabler
■ Autonomous operations with little human intervention
■ Predictive terrain analysis (course of action analysis, planning)
■ Reach enabled; auto data mining (brilliant pull)
■ Virtual/simulations data driver (battle simulation, mission rehearsal)
■ Auto filtering and scaling of information
■ Wireless
■ Mounted and/or dismounted
■ Artificial intelligence
■ Generation of responsive terrain information (Multispectral Scanner and Data System [MSDS])
■ Conflation of MSDS and national readiness terrain information
■ Connectivity to the intelligence community (NIMA, NGIC, National Astronomy and Ionosphere Center [NAIC], National Reconnaissance Office [NRO])
■ Integration of output with DCGS-A (IGI)
■ Leverage of Army Space Command – commercial imagery
■ Exploitation of all sources and sensors
■ Addition of new data types (ground photo, video, audio)
■ Sensor tasking and control
■ Data collection, including sensors and platforms (engineer-dedicated UAV feeds)
■ Update of terrain information
■ Certification and control of terrain information sets to guarantee a COP
■ Map service responsibilities
■ Geospatial database and products database
■ Ability to perform at joint level when command-designated as joint task force
■ Builder of exploitation applets
■ Adaptive/complex analysis
■ Overlay early warning/threat/environment (weather) impacts

Table 2

"network") that will eventually be sent to each system platform. It must seamlessly provide data to other Objective Force systems, such as the Distributed Common Ground System-Army (DCGS-A), the Objective Force Battle Command System, and the Future Combat System. This Objective Force geospatial system will provide unparalleled capabilities to understand the terrain and provide the foundation for the Objective Force common operational picture (COP). Table 2 shows the major requirements of the Objective Force geospatial system.

Conclusion

In conclusion, the transformation of geospatial engineering began in the late 1990s with the fielding of the DTSS and the increase in size of the geospatial teams. This transformation has already brought great success in current operations. However, the current DTSS and organization structure still does not meet all of the requirements that will be needed to support the Objective Force. The organizational and materiel solutions presented in this article will serve as the road ahead in overcoming these deficiencies and allow the Objective Force to see first and understand first. Additionally, we will develop the changes in doctrine, training, leader development, and facilities needed to bring about those solutions. Our efforts will be closely coordinated with those of other members of the community (such as NIMA, the Battle Command Battle Laboratory, the Military Intelligence School, and TEC). The future of the geospatial community and the Engineer Regiment has never been brighter.

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